MATHEMATICS ALIGNMENT

(Student Standards and Teacher Preparation Standards)

Indiana Professional Standards Board

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

	Kindergarten Student Standard	**Teacher Preparation Standard**
Standard 1. NUMBER SENSE Students understand the relationship between numbers and quantities up to 10, and that a set of objects has the same number in all situations regardless of the position or arrangement of the objects.	NUMBER SENSE • Match sets of objects • Compare sets of up to 10 objects • Know that larger numbers describe sets with more objects in them than sets described by smaller numbers • Divide sets into equal groups (up to 10 objects) • Divide shapes into equal parts • Count, recognize, represent, name and order objects (up to 10 objects) • Find the number that is one more or one less than any whole number (up to 10 objects) • Use correctly the words one/many, none/some/all, more/less, most/least • Record and organize information using objects and pictures	NUMBER SENSE • Have a well developed number sense (mathematics, estimation, reasonableness of results) • Understand number concepts, operations and properties (including basic number theory) • Understand algorithms and place value • Extend number systems from whole numbers to fractions and integers, rational and real numbers • Extend operations, properties and ordering • Notation of fractions, decimals, percents, ratio and proportion
Standard 2. COMPUTATION Students understand and describe simple additions and subtractions.	COMPUTATION • Model addition by joining sets of objects (for any two sets with fewer than 10 objects when joined) • Model subtraction by removing objects from sets (for numbers less than 10) • Describe addition and subtraction situations (for numbers less than 10)	FUNCTIONS AND USE OF VARIABLES • Develop mathematical language and symbolism and how we communicate mathematical ideas • Represent and solve problems requiring the use of variables • Understand concepts of functions and their use • Understand different representations of functions (tubular, graphical, symbolic, verbal) • Distinguish between continuous and discrete approaches

Standard 3. ALGEBRA and FUNCTIONS Students sort and classify objects.	ALGEBRA and FUNCTIONS • Identify, sort and classify objects by attributes • Identify, copy and make simple patterns	ALGEBRA and FUNCTIONS • Extend system of real numbers to complex numbers • Understand clock arithmetic • Understand modular systems • Understand matrices • Understand solutions of systems of equations
Standard 4. GEOMETRY Students identify common objects around them and describe their geometric features and position.	GEOMETRY • Identify and describe common geometric objects (circle, triangle, square, rectangle and cube) • Compare and sort common objects by position, shape, size, roundness, and number of corners • Identify and use the terms, inside, outside, above and below	GEOMETRY • Understand how geometry is used to describe the world in which we live • Analysis of 2- and 3- dimensional figures * Tessellations * Symmetry * Polygons * Polyhedra * Curved shapes • Understand synthetic geometry • Understand coordinate geometry • Understand transformational geometry • Build justifications and coherent arguments • Understand spatial visualization
Standard 5. MEASUREMENT Students understand the concept of time and units to measure it. They understand that objects have length, capacity, weight, and temperature, and that they can compare objects using these qualities.	MEASURMENT • Make direct comparisons of the length, capacity, weight and temperature of objects and recognize which object is shorter, longer, taller, lighter, heavier, warmer, cooler or holds more • Understand concepts of time: morning, afternoon, evening, today, yesterday, tomorrow, week, month, and year. Understand that clocks and calendars are tools that measure time.	MEASUREMENT • Understand the historical perspective • Understand the attributes of: * Length * Area * Volume * Capacity * Time * Temperature * Angles * Weight * Mass

Standard 6: PROBLEM SOLVING Students make decisions about how to set up a problem.	PROBLEM SOLVING • Choose the approach, materials, and strategies to use in solving problems • Use tools such as objects or drawings to model problems • Explain the reasoning used with concrete objects and pictures • Make precise calculations and check the validity of the results in the context of the problem	• Differentiate units to record measure from the process of measurement itself • Understand estimation • Understand the metric system • Understand formulas for perimeter, area, and volume PROBLEM SOLVING • Use mathematical inquiry including: * Questioning techniques * Discovery * Reasoning processes * Alternative strategies * Technology * Reflective processes * Analysis and justification * Formulating the problem

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

	1st Grade Student Standard	Teacher Preparation Standard
Standard 1. NUMBER SENSE Students understand symbols, objects, and pictures used to represent numbers up to 100 and show an understanding of fractions.	NUMBER SENSE • Count, read, and write whole numbers to 100 • Count and group objects in ones and tens • Identify the number of tens and ones (to 100) • Name the number that is one more or one less than a number (to 100) • Compare whole numbers to 10 and arrange them in numerical order • Match the number names first, second, third etc. with an ordered set of up to 10 items • Recognize when a shape is divided into congruent parts • For a shape divided into 8 or fewer congruent parts, describe a shaded portion as "____out of ___parts" and write the fraction • For a set of 8 or fewer objects, describe a subset as "____out of ___parts" and write the fraction • Represent, compare, and interpret data using pictures and picture graphs.	NUMBER SENSE • Have a well developed number sense (mathematics, estimation, reasonableness of results) • Understand number concepts, operations and properties (including basic number theory) • Understand algorithms and place value • Extend number systems from whole numbers to fractions and integers, rational and real numbers • Extend operations, properties and ordering • Notation of fractions, decimals, percents, ratio and proportion
Standard 2. COMPUTATION Students demonstrate the meaning of addition and subtraction and use these operations to solve problems.	COMPUTATION • Show the meaning of addition using objects • Show the meaning of subtraction using objects • Show equivalent forms of the same number (to 20) using objects, diagrams and numbers • Demonstrate mastery of addition facts (to 20) and corresponding subtraction facts. • Understand the meaning of the symbols +, -, and = • Understand the role of zero in addition and subtraction • Understand and use the inverse relationship between addition and subtraction to solve simple problems	FUNCTIONS AND USE OF VARIABLES • Develop mathematical language and symbolism and how we communicate mathematical ideas • Represent and solve problems requiring the use of variables • Understand concepts of functions and their use • Understand different representations of functions (tubular, graphical, symbolic, verbal) • Distinguish between continuous and discrete approaches

Standard 3. ALGEBRA AND FUNCTIONS Students use number sentences with the symbols +, -, and = to solve problems.	ALGEBRA AND FUNCTIONS • Write and solve number sentences from problem situations involving addition and subtraction • Create word problems that match given number sentences involving addition and subtraction • Recognize and use the relationship between addition and subtraction • Create and extend number patterns using addition	ALGEBRA and FUNCTIONS • Extend system of real numbers to complex numbers • Understand clock arithmetic • Understand modular systems • Understand matrices • Understand solutions of systems of equations
Standard 4. GEOMETRY Students identify common geometric shapes, classify them by common attributes, and describe their relative position or their location in space.	GEOMETRY • Identify, describe, compare, sort, and draw triangles, rectangles, squares, and circles • Identify triangles, rectangles, squares, and circles as faces of 3-dimensional objects • Classify and sort familiar plane and solid objects by position, shape. size, roundness and other attributes. Explain the rule you used • Identify objects as two- and three-dimensional • Give and follow directions for finding a place or object • Arrange and describe objects in space by position and direction: near, far, under, over, up, down, behind, in front of, next to, to the left or right of • Identify geometric shapes and structures in the environment and specify their location	GEOMETRY • Understand how geometry is used to describe the world in which we live • Analysis of 2- and 3- dimensional figures * Tessellations * Symmetry * Polygons * Polyhedra * Curved shapes • Understand synthetic geometry • Understand coordinate geometry • Understand transformational geometry • Build justifications and coherent arguments • Understand spatial visualization
Standard 5. MEASUREMENT Students learn how to measure length, as well as how to compare, order, and describe other kinds of measurements.	MEASUREMENT • Measure the length of objects by repeating a non-standard or a standard unit • Use different units to measure the length of the same object and predict whether the measure will be greater or smaller when a different unit is used. • Recognize the need for a fixed unit of length • Measure and estimate the length of an object to the nearest inch and centimeter	MEASUREMENT • Understand the historical perspective • Understand the attributes of: * Length * Area * Volume * Capacity * Time * Temperature

	• Compare and order objects according to area, capacity, weight, and temperature, using direct comparison or a non-standard unit. • Tell time to the nearest half-hour and relate time to events (before/after, shorter/longer) • Identify and give the values of pennies, nickels, and dimes.	* Angles * Weight * Mass • Differentiate units to record measure from the process of measurement itself • Understand estimation • Understand the metric system • Understand formulas for perimeter, area, and volume
Standard 6: PROBLEM SOLVING Students make decisions about how to set up a problem. Students solve problems and justify their reasoning.	PROBLEM SOLVING • Choose the approach, materials, and strategies to use in solving problems • Use tools such as objects or drawings to model problems • Explain the reasoning and justify the procedures selected in solving a problem • Make precise calculations and check the validity of the results in the context of the problem • Understand and use connections between two problems	PROBLEM SOLVING • Use mathematical inquiry including: * Questioning techniques * Discovery * Reasoning processes * Alternative strategies * Technology * Reflective processes * Analysis and justification * Formulating the problem

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

	2nd Grade Student Standard	Teacher Preparation Standard
Standard 1. NUMBER SENSE Students understand the relationships among numbers, quantities, and place value in whole numbers up to 100. They understand that fractions may refer to parts of a set and parts of a whole.	NUMBER SENSE • Count by 1s, 2s, 5s, and 10s to 100 • Identify the pattern of numbers in each group of 10 from 10s through 90s • Identify numbers up to 100 in various combinations of tens and ones. • Name the number that is 10 more or 10 less than any number 10-90 • Compare whole numbers to 100 and arrange them in numerical order • Match the number names first, second, third, etc. with an ordered set (to 100) • Identify odd and even numbers (to 100) • Recognize fractions as parts of a whole or parts of a group to (12 parts) • Recognize, name and compare the unit fractions 🗁, 🗎, 🗏, 🗐, 🗄, 🖮, 🖅, 🗀 • Know that, when all fractional parts are included, the result is equal to the whole and to one. • Collect/record numerical data in systematic ways • Represent, compare and interpret data using tables, tally charts, and bar graphs. • Model addition of numbers less than 100 with objects and pictures • Add two whole numbers less than 100 with and without regrouping • Understand and use the inverse relationship between addition and subtraction • Use estimation to decide whether answers are reasonable in addition problems • Use mental arithmetic to add or subtract 0, 1, 2, 3, 4, 5, or 10 with numbers less than 100	NUMBER SENSE • Have a well developed number sense (mathematics, estimation, reasonableness of results) • Understand number concepts, operations and properties (including basic number theory) • Understand algorithms and place value • Extend number systems from whole numbers to fractions and integers, rational and real numbers • Extend operations, properties and ordering • Notation of fractions, decimals, percents, ratio and proportion

Standard 2. COMPUTATION Students solve simple problems involving addition and subtraction of numbers up to 100.	COMPUTATION • Model addition of numbers less than 100 with objects and pictures • Add two whole numbers less than 100 with and without regrouping • Understand and use the inverse relationship between addition and subtraction • Use estimation to decide whether answers are reasonable in addition problems • Use mental arithmetic to add or subtract 0, 1, 2, 3, 4, 5, or 10 with numbers less than 100	FUNCTIONS AND USE OF VARIABLES • Develop mathematical language and symbolism and how we communicate mathematical ideas • Represent and solve problems requiring the use of variables • Understand concepts of functions and their use • Understand different representations of functions (tubular, graphical, symbolic, verbal) • Distinguish between continuous and discrete approaches
Standard 3. ALGEBRA AND FUNCTIONS Students model, represent, and interpret number relationships to create and solve problems involving addition and subtraction.	ALGEBRA AND FUNCTIONS • Relate problem situations to number sentences involving addition and subtraction • Use the commutative and associative rules for addition to simplify mental calculations and to check results. • Recognize and extend a linear pattern by rules • Create, describe, and extend number patterns using addition and subtraction	ALGEBRA and FUNCTIONS • Extend system of real numbers to complex numbers • Understand clock arithmetic • Understand modular systems • Understand matrices • Understand solutions of systems of equations
Standard 4. GEOMETRY Students identify and describe the attributes of common shapes in the plane and of common objects in space.	GEOMETRY • Construct squares, rectangles, triangles, cubes, and rectangular prisms with appropriate materials. • Describe, classify, and sort plane and solid geometric shapes (triangle, square, rectangle, cube, rectangular prism) according to the number and shape of faces, and the number of edges and vertices • Investigate and predict the result of putting together and taking apart two and three-dimensional shapes • Identify congruent two-dimensional shapes in any position • Recognize geometric shapes and structures in the environment and specify their locations	GEOMETRY • Understand how geometry is used to describe the world in which we live • Analysis of 2- and 3- dimensional figures * Tessellations * Symmetry * Polygons * Polyhedra * Curved shapes • Understand synthetic geometry • Understand coordinate geometry • Understand transformational geometry • Build justifications and coherent arguments • Understand spatial visualization

Standard 5. MEASUREMENT Students understand how to measure length, temperature, capacity, weight, and time in standard units.	MEASUREMENT • Measure and estimate length to the nearest inch, foot, yard, meter and centimeter, • Describe the relationships among inch, foot, and yard; meter and centimeter • Decide which unit of length is most appropriate in a given situation • Estimate area and use a given object to measure the area of other objects • Estimate and measure capacity using cups and pints • Estimate weight and use a given object to measure the weight of other objects • Recognize the need for a fixed unit of weight • Estimate temperature. Read a thermometer in Celsius and Fahrenheit • Tell time to the nearest quarter hour; be able to tell 5-minute intervals and differentiate a.m./p.m. • Know relationships of time • Find the duration of time intervals • Find value of a collection of coins	MEASUREMENT • Understand the historical perspective • Understand the attributes of: * Length * Area * Volume * Capacity * Time * Temperature * Angles * Weight * Mass • Differentiate units to record measure from the process of measurement itself • Understand estimation • Understand the metric system • Understand formulas for perimeter, area, and volume
Standard 6: PROBLEM SOLVING Students make decisions about how to set up a problem. Students solve problems and justify their reasoning	PROBLEM SOLVING • Choose the approach, materials, and strategies to use in solving problems • Use tools such as objects or drawings to model problems • Explain the reasoning and justify the procedures selected in solving a problem • Make precise calculations and check the validity of the results in the context of the problem • Understand and use connections between two problems	PROBLEM SOLVING • Use mathematical inquiry including: * Questioning techniques * Discovery * Reasoning processes * Alternative strategies * Technology * Reflective processes * Analysis and justification * Formulating the problem

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

	3rd Grade Student Standard	Teacher Preparation Standard
Standard 1. NUMBER SENSE Students understand the relationships among numbers, quantities, and place value in whole numbers up to 1,000. They understand the relationship among whole numbers, simple fractions and decimals.	NUMBER SENSE • Count, read and write whole numbers (to 1000) • Identify and interpret place value in whole numbers (to 1000) • Use words, models and expanded form to represent numbers to 1000 • Identify any number to 1000 in various combinations of hundreds, tens, and ones. • Compare whole numbers to 1000 and arrange them in numerical order • Round numbers less than 1000 to the nearest ten and the nearest hundred • Identify odd and even numbers to 1000 and describe their characteristics • Show equivalent fractions using equal parts • Identify and use correct names for numerators and denominators • Given a pair of fractions, decide which is larger or smaller by using objects or pictures • Given a set of objects or a picture, name and write a decimal to represent tenths and hundredths • Given a decimal for tenths, show it as a fraction using a place-value model • Interpret data displayed in a circle graph and answer questions about the situation • Identify whether everyday events are certain, likely, unlikely, or impossible • Record the possible outcomes for a simple probability experiment	NUMBER SENSE • Have a well developed number sense (mathematics, estimation, reasonableness of results) • Understand number concepts, operations and properties (including basic number theory) • Understand algorithms and place value • Extend number systems from whole numbers to fractions and integers, rational and real numbers • Extend operations, properties and ordering • Notation of fractions, decimals, percents, ratio and proportion

Standard 2. COMPUTATION Students solve problems involving addition and subtraction of whole numbers. They model and solve simple problems involving multiplication and division.	COMPUTATION • Add and subtract whole numbers up to 1,000 with or without regrouping using relevant properties of the number system • Represent the concept of multiplication as repeated addition • Represent the concept of division as repeated subtraction, equal sharing, and forming equal groups • Know and use the inverse relationship between multiplication and division facts • Show mastery of multiplication facts for 2, 5, and 10 • Add and subtract simple fractions with the same denominator • Use estimation to decide whether answers are reasonable in + and – problems • Use mental arithmetic to add or subtract with numbers less than 100.	FUNCTIONS AND USE OF VARIABLES • Develop mathematical language and symbolism and how we communicate mathematical ideas • Represent and solve problems requiring the use of variables • Understand concepts of functions and their use • Understand different representations of functions (tubular, graphical, symbolic, verbal) • Distinguish between continuous and discrete approaches
Standard 3. ALGEBRA AND FUNCTIONS Students select appropriate symbols, operations, and properties to represent, describe, simplify, and solve simple number and functional relationships.	ALGEBRA AND FUNCTIONS • Represent relationships of quantities in the form of a numeric expression or equation • Solve problems involving numeric equations • Choose appropriate symbols for operations and relations to make a number sentence true • Understand and use the commutative and associative rules of multiplication • Create, describe, and extend number patterns using multiplication • Solve simple problems involving a functional relationship between two quantities • Plot and label whole numbers on a number line up to 10	ALGEBRA and FUNCTIONS • Extend system of real numbers to complex numbers • Understand clock arithmetic • Understand modular systems • Understand matrices • Understand solutions of systems of equations

Standard 4. GEOMETRY Students describe and compare the attributes of plane and solid geometric shapes and use their understanding to show relationships and solve problems.	GEOMETRY • Identify quadrilaterals as four-sided shapes • Identify right angles in shapes and objects and decide whether other angles are greater than or less than a right angle. • Identify, describe, and classify: cube, sphere, prism, pyramid, cone, cylinder • Identify common solid objects that are the parts needed to make a more complex solid object • Draw a shape that is congruent to another shape • Use the terms point, line, and line segment in describing two-dimensional shapes • Draw a line segment and lines • Identify and draw lines of symmetry in geometric shapes (by hand or using technology) • Sketch the mirror image reflections of shapes • Recognize geometric shapes and their properties in the environment and specify their locations	GEOMETRY • Understand how geometry is used to describe the world in which we live • Analysis of 2- and 3- dimensional figures * Tessellations * Symmetry * Polygons * Polyhedra * Curved shapes • Understand synthetic geometry • Understand coordinate geometry • Understand transformational geometry • Build justifications and coherent arguments • Understand spatial visualization
Standard 5. MEASUREMENT Students choose and use appropriate units and measurement tools for length, capacity, weight, temperature, time and money.	MEASUREMENT • Measure line segments to the nearest half-inch • Add units of length that may require regrouping of inches to feet or centimeters to meters. • Find the perimeter of a polygon • Estimate or find the area of shapes by covering them with squares • Estimate or find the volume of objects by counting the number of cubes that would fill them • Estimate and measure capacity using quarts, gallons and liters. • Estimate and measure weight using pounds and kilograms • Compare temperatures in Celsius and Fahrenheit • Find the value of any collection of coins and bills. Write amounts less than a dollar using the ¢ symbol	MEASUREMENT • Understand the historical perspective • Understand the attributes of: * Length * Area * Volume * Capacity * Time * Temperature * Angles * Weight * Mass • Differentiate units to record measure from the process of measurement itself • Understand estimation • Understand the metric system

	and write larger amounts in decimal notation using the $ symbol • Use play or real money to decide whether there is enough money to make a purchase • Carry out simple unit conversions within a measurement system (e.g. centimeters to meters, hours to minutes)	• Understand formulas for perimeter, area, and volume
Standard 6: PROBLEM SOLVING Students make decisions about how to approach problems and communicate their ideas. Students use strategies, skills, and concepts in finding and communicating solutions to problems. Students determine when a solution is complete and reasonable and move beyond a particular problem by generalizing to other situations.	PROBLEM SOLVING • Analyze problems by identifying relationships, telling relevant from irrelevant information, sequencing and prioritizing information, and observing patterns. • Decide when and how to break a problem into simpler parts • Apply strategies and results from simpler problems to solve complex problems • Express solutions clearly and logically by using the appropriate mathematical terms and notation. Support solutions with evidence in both verbal and symbolic work • Recognize the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy • Know and use strategies for estimating results of whole-number addition and subtraction • Make precise calculations and check the validity of the results in the context of the problem • Decide whether a solution is reasonable in the context of the original situation • Note the method of finding the solution and show a conceptual understanding of the method by solving similar problems.	PROBLEM SOLVING • Use mathematical inquiry including: * Questioning techniques * Discovery * Reasoning processes * Alternative strategies * Technology * Reflective processes * Analysis and justification * Formulating the problem

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

	4th Grade Student Standard	**Teacher Preparation Standard**
Standard 1. NUMBER SENSE Students understand the place value of whole numbers and decimals to two decimal places and how whole numbers and decimals relate to simple fractions.	NUMBER SENSE • Demonstrate place value system to count, read, and write whole numbers up to 1,000,000 • Use decimals to two places • Order and compare whole numbers < > • Understand concept of fractions to mixed numbers • Demonstrate how fractions are related to whole numbers • Extend skills with decimals and how they relate to fractions	NUMBER SENSE • Understand estimation • Explain reasonableness of results • Use number concepts, operations, and properties • Understand basic number theory • Understand the role of algorithms • Understand place value • Explain how to extend the number systems from the whole numbers to fractions and integers • Understand rational and real numbers • Discuss the extension of the operations, properties, and ordering • Understand notions of fractions, decimals, percents, ration, and proportion
Standard 2. COMPUTATION Students solve problems involving addition, subtraction, multiplication, and division of whole numbers and understand the relationships among these operations. They extend their use and understanding of whole numbers to the addition and subtraction of simple fractions and decimals.	COMPUTATION • Demonstrate fluency in computation • Learn about numbers • Learn how to add, subtract, multiply, and divide • Understand the special roles of 0 and 1 in multiplication and division • Add and subtract fractions and decimals • Learn how these different representations of numbers can be manipulated	FUNCTIONS AND USE OF VARIABLES • Understand development of mathematical language and symbolism and symbolism • Explain how mathematical language and symbolism have influenced the way we communicate • Have experience in representing and solving problems requiring the use of variables • Understand basic concepts of functions and their use in the growth of mathematical ideas • Demonstrate different representations of functions (tabular, graphical, symbolic, verbal) • Explain how to move among these representations • Know the strengths and limitations of each representation • Know the distinction between continuous and discrete approaches in the solution of mathematical problems

Standard 3. ALGEBRA AND FUNCTIONS Students use and interpret variables, mathematical symbols, and properties to write and simplify numerical expressions and sentences. They understand relationships among the operations of addition, subtraction, multiplication, and division. **Standard 4. GEOMETRY** Students show an understanding of plane and solid geometric objectives and use this knowledge to show relationships and solve problems.	ALGEBRA • Develop an understanding of the fundamental concept of a variable • Use a letter to represent all numbers of a certain kind Write formulas and equations with letter representation • Understand equations that give the rule for a function • Number patterns involving multiplication and division Recognize and apply the relationships among the four operations of addition, subtraction, multiplication, and division Develop the connection between numbers and number lines • Estimating positions on a number line GEOMETRY • Identify, describe, and draw such concepts as acute angles and parallel lines • Describe shapes and objects, including special quadrilaterals (rhombuses and trapezoids) • Identify congruent quadrilaterals and explain their reasoning using specific geometric terms • Draw lines of symmetry for various polygons, • Construct cubes and prisms • Develop ability to work in three dimensions	NUMBER SYSTEMS AND ALGEBRAIC STRUCTURES • The system of real numbers should be extended to complex numbers • Investigate selected algebraic structures • Provide concrete examples such as clock arithmetic, modular systems, and matrices • Understand properties of the operation in these structures • Investigate how these structures are reflected in the number systems of school mathematics • Use of matrices and matrix operations to record information and to deal with solutions of systems of equations GEOMETRY • Understand how geometry is used to describe the world in which we live • Understand that geometry can be used to solve real-world problems • Analyze two- and three- dimensional figures • Include the study of tessellations, symmetry, polygons, polyhedra, and curved shapes • Use synthetic, coordinate, and transformational geometry • Solve problems and hone skills in building justifications and coherent arguments for the plausibility of conjectures • Emphasize spatial visualization

Standard 5. MEASUREMENT Students understand perimeter and areas, as well as measuring volume, capacity, time, and money.	MEASUREMENT • Measure length to the nearest eighth-inch • Measure length to the nearest millimeter • Subtract units of length • Develop and use the formulas for calculating perimeters and areas of rectangles • Compare the concepts of volume and capacity • Add time intervals • Calculate the amount of change from a purchase	MEASUREMENT • Understand measurement needs to be understood from the perspective of its historical development • Know that attributes of what we measure include length, area, volume, capacity, time, temperature, angles, weight, and mass • Understand that the units to record measure are different from the process of measurement itself • Ideas are reinforced through varied experience, using both standard and nonstandard units • Learn to estimate lengths, areas, etc. • Know the System International d'Units (the metric system) • Derivations of the formulas for the perimeter, area, and volume of common figures should be approached through meaningful explorations • Indirect measurement and its many applications should be studied
Standard 6. DATA ANALYSIS AND PROBABILITY Students organize, represent, and interpret numerical and categorical data and clearly communicate their findings. They show outcomes for simple probability situations.	DATA ANALYSIS AND PROBABILITY • Represent data on a number line and in tables, including frequency tables • Interpret data graphs to answer questions about a situation	STATISTICS AND PROBABILITY • Understand variety of experiences in the collection, organization, representation, and analysis, and interpretation of data • Understand measures of central tendency, measures of variation (range, standard deviation, interquartile range, and outliers), and general distributions

Standard 7: PROBLEM SOLVING Students make decisions about how to approach problems and communicate their ideas. Students use strategies, skills, and concepts in finding and communicating solutions to problems. Students determine when a solution is complete and reasonable and move beyond a particular problem by generalizing to other situations.	PROBLEM SOLVING • Choose how to approach a problem • Explain the reasoning, and they check results Develop skills with numbers, geometry, or measurement • Move from simple ideas to more complex ones by taking logical steps that build a better understand of mathematics	PROBLEM SOLVING • Understand questioning techniques which include: * Discovery * Reasoning processes * Alternative strategies * Technology * Reflective processes * Analysis and justification * Formulating the problem

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

	5th Grade Student Standard	**Teacher Preparation Standard**
Standard 1. NUMBER SENSE Students compute with whole numbers, decimals, and fractions and understand the relationship among decimals, fractions, and percents. They understand the relative magnitudes of numbers. They understand prime and composite numbers.	NUMBER SENSE • Understand magnitudes of numbers rounding whole numbers and decimals to any place value • Order and compare whole numbers and decimals < > • Explain percentage as parts of a hundred • Compare different ways to looking at fractions • Identify whole numbers as prime or composite Compare fractions, decimals, and mixed numbers on a number line	NUMBER SENSE • Understand estimation • Explain reasonableness of results • Use number concepts, operations, and properties • Understand basic number theory • Understand the role of algorithms • Understand place value • Explain how to extend the number systems from the whole numbers to fractions and integers • Understand rational and real numbers • Discuss the extension of the operations, properties, and ordering • Understand notions of fractions, decimals, percents, ration, and proportion
Standard 2. COMPUTATION Students solve problems involving multiplication and division of whole numbers and solve problems involving addition, subtraction, and simple multiplication and division of fractions and decimals.	COMPUTATION • Extend the standard methods for multiplying and diving to larger numbers • Add and subtract more complex fractions and decimals • Learn how different representations of numbers can be manipulated • Develop an understanding of how to multiply and divide fractions	FUNCTIONS AND USE OF VARIABLES • Understand development of mathematical language and symbolism and symbolism • Explain how mathematical language and symbolism have influenced the way we communicate • Have experience in representing and solving problems requiring the use of variables • Understand basic concepts of functions and their use in the growth of mathematical ideas • Demonstrate different representations of functions (tabular, graphical, symbolic, verbal) • Explain how to move among these representations • Know the strengths and limitations of each representation • Know the distinction between continuous and discrete approaches in the solution of mathematical problems

Standard 3. ALGEBRA AND FUNCTIONS Students use variables in simple expressions, compute the value of an expression for specific values of the variable, and plot and interpret the results. They use two-dimensional coordinate grids to represent points and graph lines. **Standard 4. GEOMETRY** Students identify, describe, and classify the properties of plane and solid geometric shapes and the relationships between them.	ALGEBRA AND FUNCTIONS • Develop further the fundamental concept of a variable • Use a letter to stand for all numbers of a certain kind • Write simple algebraic expressions • Evaluate simple algebraic expressions Begin to develop the idea of linking an algebraic equation to a graph • Find ordered pairs that fit a linear equation • Plot ordered pairs as points on a grid, and drawing the resulting straight line • Interpret graphs to answer questions GEOMETRY • Draw angles, parallel and perpendicular lines • Identify radius and diameter of circles • Describe geometric shapes, using ruler, compass, protractor, and computer drawing programs • Identify congruent triangles • Explain congruent triangle reasoning using specific geometrical terms • Understand and use terms such as equilateral, isosceles, acute, and obtuse • Classify polygons with five or more sides • Develop an understanding of reflectional and rotational symmetry • Construct prisms and pyramids • Develop an ability to work in three dimensions • Develop and see the formulas for calculating perimeters and areas of triangles, parallelograms, and trapezoids	NUMBER SYSTEMS AND ALGEBRAIC STRUCTURES • The system of real numbers should be extended to complex numbers • Investigate selected algebraic structures • Provide concrete examples such as clock arithmetic, modular systems, and matrices • Understand properties of the operation in these structures • Investigate how these structures are reflected in the number systems of school mathematics • Use of matrices and matrix operations to record information and to deal with solutions of systems of equations GEOMETRY • Understand how geometry is used to describe the world in which we live • Understand that geometry can be used to solve real-world problems • Analyze two- and three- dimensional figures • Include the study of tessellations, symmetry, polygons, polyhedra, and curved shapes • Use synthetic, coordinate, and transformational geometry • Solve problems and hone skills in building justifications and coherent arguments for the plausibility of conjectures • Emphasize spatial visualization

Standard 5. MEASUREMENT Students understand and compute the areas and volumes of simple objects, as well as measuring weight, temperature, time, and money.	MEASUREMENT • Develop and see the formulas for calculating perimeters and areas of triangles, parallelograms, and trapezoids • Extend these ideas to finding the volume and surface area of rectangular solids • Understand and use additional units for measuring weight: ounce, gram, and ton • Add and subtract with money in decimal notation	MEASUREMENT • Understand measurement needs to be understood from the perspective of its historical development • Know that attributes of what we measure include length, area, volume, capacity, time, temperature, angles, weight, and mass • Understand that the units to record measure are different from the process of measurement itself • Ideas are reinforced through varied experience, using both standard and nonstandard units • Learn to estimate lengths, areas, etc. • Know the System International d'Units (the metric system) • Derivations of the formulas for the perimeter, area, and volume of common figures should be approached through meaningful explorations • Indirect measurement and its many applications should be studied
Standard 6. DATA ANALYSIS AND PROBABILITY Students collect, display, analyze, compare, and interpret data sets. They use the results of probability experiments to predict future events.	DATA ANYALYSIS AND PROBABILITY • Explain which types of displays are appropriate for various sets of data • Find the mean, median, mode, and range of a set of data which describe what each does and does not tell about the data set. • Understand that probability can take any value between 0 and 1 • Express outcomes of experimental probability	STATISTICS AND PROBABILITY • Understand variety of experiences in the collection, organization, representation, and analysis, and interpretation of data • Understand measures of central tendency, measures of variation (range, standard deviation, interquartile range, and outliers), and general distributions

Standard 7: PROBLEM SOLVING Students make decisions about how to approach problems and communicate their ideas. They use strategies, skills, and concepts in finding and communicating solutions to problems. They determine when a solution is complete and reasonable and move beyond a particular problem by generalizing to other situations.	PROBLEM SOLVIING • Choose how to approach a problem • Explain the reasoning, and check results • Develop skills with algebra, geometry, or measurement • Move from simple to more complex ideas by taking logical steps that build a better understanding of mathematics	PROBLEM SOLVING • Understand questioning techniques which include: * Discovery * Reasoning processes * Alternative strategies * Technology * Reflective processes * Analysis and justification * Formulating the problem

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

	6th Grade Student Standard	**Teacher Preparation Standard**
Standard 1. NUMBER SENSE Students compare and order positive and negative integers, decimals, fractions, and mixed numbers. They find multiples and factors.	NUMBER SENSE • Understand the relationship between fractions and decimals • Extend the number system to include negative numbers • Relate percentages to fractions and decimals • Learn how to use rations • Find multiples and factors of whole numbers • Use multiples and factors to solve problems involving fractions	NUMBER SENSE • Understand estimation • Explain reasonableness of results • Use number concepts, operations, and properties • Understand basic number theory • Understand the role of algorithms • Understand place value • Explain how to extend the number systems from the whole numbers to fractions and integers • Understand rational and real numbers • Discuss the extension of the operations, properties, and ordering • Understand notions of fractions, decimals, percents, ration, and proportion
Standard 2. COMPUTATION Students solve problems involving addition, subtraction, multiplication, and division of integers. They solve problems involving fractions, decimals, ratios, proportions, and percentages.	COMPUTATION • Add, subtract, multiply, and divide fractions, decimals, and both positive and negative integers • Solve problems using ratios, proportions, and percentages, • Calculate discount and interest • Use mental arithmetic and subtract simple fractions and decimals	FUNCTIONS AND USE OF VARIABLES • Understand development of mathematical language and symbolism and symbolism • Explain how mathematical language and symbolism have influenced the way we communicate • Have experience in representing and solving problems requiring the use of variables • Understand basic concepts of functions and their use in the growth of mathematical ideas • Demonstrate different representations of functions (tabular, graphical, symbolic, verbal) • Explain how to move among these representations • Know the strengths and limitations of each representation • Know the distinction between continuous and discrete approaches in the solution of mathematical problems

Standard 3. ALGEBRA AND FUNCTIONS Students write verbal expressions and sentences as algebraic expressions and equations. They evaluate algebraic expressions, solve simple linear equations, and graph and interpret their results. They investigate geometric relationships and describe them algebraically.	ALGEBRA AND FUNCTIONS • Write and solve simple equations and inequalities • Write and use formulas to solve problems • Use parentheses in more complex expressions to show the order of operations • Extend graphs of straight lines to include negative values	NUMBER SYSTEMS AND ALGEBRAIC STRUCTURES • The system of real numbers should be extended to complex numbers • Investigate selected algebraic structures • Provide concrete examples such as clock arithmetic, modular systems, and matrices • Understand properties of the operation in these structures • Investigate how these structures are reflected in the number systems of school mathematics • Use of matrices and matrix operations to record information and to deal with solutions of systems of equations
Standard 4. GEOMETRY Students identify, describe, and classify the properties of plane and solid geometric shapes and the relationships between them.	GEOMETRY • Draw special types of angles and use them to solve problems • Find and use the sum of the angles of a triangle and of a quadrilateral • Identify shapes that are similar (the same shape but necessarily the same size) • Draw reflections and translations of shapes • Draw two-dimensional views of three-dimensional shapes	GEOMETRY • Understand how geometry is used to describe the world in which we live • Understand that geometry can be used to solve real-world problems • Analyze two- and three- dimensional figures • Include the study of tessellations, symmetry, polygons, polyhedra, and curved shapes • Use synthetic, coordinate, and transformational geometry • Solve problems and hone skills in building justifications and coherent arguments for the plausibility of conjectures • Emphasize spatial visualization
Standard 5. MEASUREMENT Students deepen their understanding of the	MEASUREMENT • Measure in order to compare lengths, areas, volumes, weights, times, temperatures, etc. • Learn about the number π and use it to calculate the	MEASUREMENT • Understand measurement needs to be understood from the perspective of its historical development • Know that attributes of what we measure include

measurement of plane and solid shapes and use this understanding to solve problems. They calculate with temperature and money, and choose appropriate units of measure in other areas.	circumference and area of circles • Construct models, find the volume and surface area of prisms and cylinders • Convert temperatures between Celsius and Fahrenheit..	length, area, volume, capacity, time, temperature, angles, weight, and mass • Understand that the units to record measure are different from the process of measurement itself • Ideas are reinforced through varied experience, using both standard and nonstandard units • Learn to estimate lengths, areas, etc. • Know the System International d'Units (the metric system) • Derivations of the formulas for the perimeter, area, and volume of common figures should be approached through meaningful explorations • Indirect measurement and its many applications should be studied
<u>Standard 6. DATA ANALYSIS AND PROBABILITY</u> Students compute and analyze statistical measures for data sets. They determine theoretical and experimental probabilities and use them to make predictions about events.	DATA ANALYSIS AND PROBABILITY • Organize and display single-variable data • Make frequency tables for numerical data • Compare the mean, median and mode for a set of data • Show all possible outcomes for compound events • Use data to estimate the probability of future events • Understand and represent probabilities as ratios, decimals and percentages	STATISTICS AND PROBABILITY • Understand variety of experiences in the collection, organization, representation, and analysis, and interpretation of data • Understand measures of central tendency, measures of variation (range, standard deviation, interquartile range, and outliers), and general distributions
<u>Standard 7: PROBLEM SOLVING</u> Students make decisions about how to approach problems and communicate their ideas. They use strategies, skills, and concepts in finding and	PROBLEM SOLVING • Choose how to approach a problem • Explain the reasoning, and they check results • Develop skills with negative numbers, calculating angles, or finding areas • Move from simple to more complex ideas by taking logical steps that build a better understanding of mathematics	PROBLEM SOLVING • Understand questioning techniques which include: * Discovery * Reasoning processes * Alternative strategies * Technology * Reflective processes * Analysis and justification

communicating solutions to problems. They determine when a solution is complete and reasonable and move beyond a particular problem by generalizing to other situations.		* Formulating the problem

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

	7th Grade Student Standard	**Teacher Preparation Standard**
Standard 1. NUMBER SENSE Students understand and use scientific notation and square roots. They convert Between fractions and decimals.	NUMBER SENSE • Read, write, compare, solve problems using whole numbers in scientific notation • Compare and order rational and common irrational numbers on a number line • Identify rational and common irrational numbers from a list • Understand and compute whole number powers of whole numbers • Find prime factorization of whole numbers and write using exponents • Understand and apply concept of square root • Convert terminating decimals into reduced fractions.	NUMBER SENSE • Understand number sense • Understand mathematics concepts • Understand estimation • Explain reasonableness of results • Understand the use of number concepts, operations, and properties • Understand basic number theory • Understand the role of algorithms • Understand place value • Extend number systems from the whole numbers to fractions and integers • Understand rational and real numbers • Discuss the extension of the operations, properties, and ordering • Understand notions of fractions, decimals, percents, ratio and proportion
Standard 2. COMPUTATION Students make problems involving integers, fractions, decimals, ratios, and percentages.	COMPUTATION • Add, subtract, multiply, divide using integers, fractions, decimals, and combinations of the four operations • Calculate percentage increase and decrease of a quantity • Solve problems involving discounts, markups and commissions • Use estimation to decide reasonableness in problems involving fractions and decimals • Use mental arithmetic to compute simple fractions, decimals, and powers	FUNCTIONS AND USE OF VARIABLES • Experience development of mathematical language and symbolism and how these influence the way we communicate mathematical ideas • Experience representing and solving problems requiring use of variables • Have basic understanding of concepts of functions and use in growth of mathematical ideas • Understand different representations of functions (tabular, graphical, symbolic, verbal); movement among these representations; strengths and limitations of each fundamental • Know distinction between continuous and discrete approaches in solution of mathematical problems

Standard 3. ALGEBRA AND FUNCTIONS Students express quantitative relationships using algebraic terminology, expressions, equations, inequalities, and graphs.	ALGEBRA AND FUNCTIONS • Use variables and appropriate operations to write an expression, a formula, an equation, or an inequality that represents a verbal description • Write and solve two-step linear equations and inequalities in one variable and check answers • Use correct algebraic terminology • Evaluate numerical expressions and simplify algebraic expressions by applying correct order of operations and properties of rational numbers • Solve an equation of formula with two variables for a particular variable • Define slope as vertical change per unit of horizontal change and recognize that a straight line has constant slope • Find slope of a line from its graph • Draw the graph line given the slope and one point on the line, or two points on the line • Identify functions as linear or nonlinear and examine their characteristics in tables, graphs, and equation • Identify and describe situations with constant or varying rates	NUMBER SYSTEM AND ALGEBRAIC STRUCTURES • System of real numbers should be extended to complex numbers • Investigations of algebraic structures should include concrete examples such as clock arithmetic, modular systems, and matrices • Use of matrices and matrix operations to record information and deal with solutions of systems of equations
Standard 4. GEOMETRY Students deepen their understanding of plane and solid geometric shapes by constructing shapes that meet given conditions and by identifying attributes of shapes.	GEOMETRY • Understand coordinate graphs and use them to plot simple shapes, find lengths and areas related to the shapes, find their images under translations, rotations, and reflections • Understand that transformations such as slides, turns, and flips preserve length of segments and figures resulting from slides, turns, and flips are congruent to the original figures • Know and understand the Pythagorean Theorem, use it to find length of the missing side of a right triangle and the lengths of other line segments	GEOMETRY • Understand how geometry is used to describe the world in which we live • Analyze 2- and 3- dimensional figures • Include the study of tessellations, symmetry, polygons, polyhedra, and curved shapes, • Include the study of synthetic geometry, coordinate geometry, transformational geometry • Build justifications and coherent arguments • Understand spatial visualization

	• Use direct measurement to test conjectures about triangles • Construct two-dimensional patters for three-dimensional objects, such as right prisms, pyramids, cylinders, and cones	
Standard 5. MEASUREMENT Students compare units of measure and use similarity to solve problems. They compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less regular objects.	MEASUREMENT • Compare length, area, volume, weight, capacity, time, and temperature within measurement systems • Use experimentation and modeling to visualize similarity problems solve problems using similarity • Read and create drawings made to scale, construct scale models, solve problems related to scale • Use formulas for finding perimeter and area of two-dimensional shapes and surface areas and volume of three-dimensional shapes including rectangles, parallelograms, trapezoids, triangles, circles, right prisms, and cylinders • Estimate and compute area of complex and irregular two-dimensional shapes by dividing them into more basic shapes • Use objects and geometry modeling tools to compute the surface area of the faces and volume of a three-dimensional object built form rectangular solids	MEASUREMENT • Understand measurement from the perspective of historical development • Know that what we measure includes length, area, volume, capacity, time, temperature, angles, weight, and mass • Understand that units to record measurements are different from the process of measurement • Reinforce ideas through varied experiences using both standard and nonstandard units • Estimation of measurement should be understood and practiced • Understand the system International d'Units (metric system) • Understand the derivations of formulas for perimeter, area and volume • Indirect measurement and its many applications should be understood
Standard 6. DATA ANALYSIS AND PROBABILITY Students collect, organize, and represent data sets and identify relationships among variables within a data set by hand and through the use of an electronic spreadsheet software program. They determine probabilities and	DATA ANALYSIS AND PROBABILITY • Analyze, interpret, and display data in appropriate bar, line, and circle graphs and stem-and-leaf plots, justify choice of display • Make predictions from statistical data • Describe how additional data added to a data set may affect the mean, median, and mode • Analyze data displays including ways they can be misleading. Analyze ways in which wording of	STATISTICS AND PROBABILITY • Experience in collecting, organizing, representing, analyzing, and interpreting data • Understand statistical concepts of measures of central tendency, measures of variation, and general distribution • Know how to represent data in various graphs including bar, line, circle and pictographs, line plots, stem-and-leaf plots, box plots, histograms, scatter

use them to make predictions about events.	questions can influence survey results • Know that if *P* is the probability of an event occurring then 1-*P* is the probability of that event not occurring • Understand that the probability of either one or the other of two disjointed events occurring is the sum of the two individual probabilities • Find the number of possible arrangements of several objects using a tree diagram	plots • Understand probability of simple and compound events and its use in quantifying uncertainty • Provide opportunities to explore empirical probability from simulations and from data collected and analyzation of theoretical probability on the basis of a description of the underlying sample space • Use of probability trees and simulations using objects such as spinners, dice, slips of paper, etc. to solve problems
Standard 7: PROBLEM SOLVING Students make decisions about how to approach problems and communicate their ideas. They use strategies, skills, and concepts in finding and communicating solutions to problems. They determine when a solution is complete and reasonable and move beyond a particular problem by generalizing to other situations.	PROBLEM SOLVING • Analyze problems by identifying relationships, telling relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns • Make and justify mathematical conjectures based on a general description of a mathematical question or problem • Decide when and how to divide a problem into simpler parts • Apply strategies and results from simpler problems to more complex problems • Make and test conjectures by using inductive reasoning • Express the solution clearly and logically by using the appropriate mathematical terms and notation, support solutions with evidence in both verbal and symbolic work • Recognize the relative advantages of exact and approximate solutions, give answers to a specified degree of accuracy • Select and apply appropriate methods for estimating results of rational-number computations	PROBLEM SOLVING • Use instructional strategies to encourage student's development of critical thinking, problem solving, and performance skills • Understand problem solving and the reasoning process as the basis for mathematical inquiry

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

	8th Grade Student Standard	**Teacher Preparation Standard**	
Standard 1. NUMBER SENSE Students know the properties of rational and irrational numbers expressed in a variety of forms. They understand and use exponents, powers, and roots.	NUMBER SENSE • Read, write, compare, solve problems using decimals in scientific notation • Know that every rational number is either a terminating or repeating decimal and every irrational number is a non-repeating decimal • Understand computations with an irrational number and a ration number (other than zero) produce an irrational number • Understand and evaluate negative integer exponents • Use laws of exponents for integer exponents • Use inverse relationship between squaring and finding the square root of perfect integers • Calculate and find approximations of square roots	NUMBER SENSE • Understand number sense • Understand mathematics concepts • Understand estimation • Explain reasonableness of results • Understand the use of number concepts, operations, and properties • Understand basic number theory • Understand the role of algorithms • Understand place value • Extend number systems from the whole numbers to fractions and integers • Understand rational and real numbers • Discuss the extension of the operations, properties, and ordering • Understand notions of fractions, decimals, percents, ratio and proportion	NUMBER SENS • Number se • Mathematic • Estimation • Reasonable • Understand operations, • Basic numb • Role of alg • Place value • Extend nun fractions ar • Rational an • Discussion properties, • Notions of proportion
Standard 2. COMPUTATION Students compute with rational numbers expressed in a variety of forms. They solve problems involving rations, proportions, and percentages.	COMPUTATION • Add, subtract, multiply, divide rational numbers in multi-step problems (integers, fractions, terminating decimals) • Compute simple and compound interest • Use estimation techniques to reasonableness of answers computed on a calculator • Use mental arithmetic to compute common fractions, decimals, powers, and percents	FUNCTIONS AND USE OF VARIABLES • Experience development of mathematical language and symbolism and how these influence the way we communicate mathematical ideas • Experience representing and solving problems requiring use of variables • Have basic understanding of concepts of functions and use in growth of mathematical ideas • Understand different representations of functions (tabular, graphical, symbolic, verbal); movement among these representations; strengths and limitations of each fundamental • Know distinction between continuous and discrete approaches in solution of mathematical problems	FUNCTIONS A • Experience and symbol communica • Experience requiring us • Basic unde in growth o • Understand (tabular, gr among thes of each fun • Distinction approaches

Standard 3. ALGEBRA AND FUNCTIONS Students solve simple linear equations and inequalities. They interpret and evaluate expressions involving integer powers. They graph and interpret functions. They understand the concepts of slope and rate.	ALBEGRA AND FUNCTIONS • Write and solve linear equations and inequalities in one variable, interpret solution in context, verify reasonableness of results • Solve systems of two linear equations using substitution methods, identify solution graphically • Interpret positive integer powers as repeated multiplication and negative integer powers as repeated division • Use correct order of operations to find values of algebraic expressions involving powers • Identify and graph linear functions, identify lines with positive and negative slope • Find slope of a linear function given the equation, write the equation given the slope and any point on the line • Demonstrate an understanding of rate as a measure of one quantity with respect to another quantity • Demonstrate understanding of relationships among tables, equations, verbal expressions, and graphs of linear functions • Represent simple quadratic functions using verbal descriptions, tables, graphs, formulas, and translate among these representations • Graph functions of the form $y=2x_2$ and $y=2x_3$, describe similarities and differences in the graphs	NUMBER SYSTEM AND ALGEBRAIC STRUCTURES • System of real numbers should be extended to complex numbers • Investigations of algebraic structures should include concrete examples such as clock arithmetic, modular systems, and matrices • Use of matrices and matrix operations to record information and deal with solutions of systems of equations	ALGEBRA ANI • System of r complex nu • Investigatio concrete ex systems, an • Use of matr information equations
Standard 4. GEOMETRY Students deepen their understanding of plane and solid geometric shapes by constructing shapes that meet given conditions, by identifying attributes of shapes, and by applying geometric concepts	GEOMETRY • Identify and describe basic properties of geometric shapes: altitudes, diagonals, angle bisectors, perpendicular bisectors, central angles, radii, diameters, and chords of circles • Perform simple constructions such as bisectors of segments and angles, copies of segments and angles, and perpendicular segments, describe and justify the	GEOMETRY • Understand how geometry is used to describe the world in which we live • Analyze 2- and 3- dimensional figures • Include the study of tessellations, symmetry, polygons, polyhedra, and curved shapes, • Include the study of synthetic geometry, coordinate geometry, transformational geometry	GEOMETRY • Understand in which we • Analysis of • Tessellation • Symmetry • Polygons • Polyhedra

to solve problems.	constructions • Identify properties of three-dimensional geometric objects, describe how two or more figures intersect in a plane or in space • Draw the translation, rotation, reflection, and dilation of shapes • Use the Pythagorean Theorem and its converse to solve problems in two and three dimensions	• Build justifications and coherent arguments • Understand spatial visualization	• Curved shap • Synthetic ge • Coordinate g • Transformat • Build justifi • Spatial visua
Standard 5. MEASUREMENT Students convert between units of measure and use rates and scale factors to solve problems. They compute the perimeter, area, and volume of geometric objects. They investigate how perimeter, area, and volume are affected by changes of scale.	MEASUREMENT • Convert common measurements for length, area, volume, weight, capacity, and time to equivalent measurements within the same system • Solve simple problems involving rates and derived measurements for such attributes as velocity and density • Solve problems involving scale factors, area, and volume, using ratio and proportion • Use formulas for finding perimeter and area of two-dimensional shapes and surface area and volume of three-dimensional shapes, including rectangles, parallelograms, trapezoids, triangles, circles, prisms, cylinders, and pyramids • Estimate and compute area and volume of irregular two-and three -dimensional shapes by breaking them into more basic geometric objects	MEASUREMENT • Understand measurement from the perspective of historical development • Know that what we measure includes length, area, volume, capacity, time, temperature, angles, weight, and mass • Understand that units to record measurements are different from the process of measurement • Reinforce ideas through varied experiences using both standard and nonstandard units • Estimation of measurement should be understood and practiced • Understand the system International d'Units (metric system) • Understand the derivations of formulas for perimeter, area and volume • Indirect measurement and its many applications should be understood	MEASUREMEN • Understand historical d • What we m capacity, ti • Understand different fr • Reinforce i standard an • Estimation practiced • Understand system) • Understand area and vo • Indirect me should be u
Standard 6. DATA ANALYSIS AND PROBABILITY Students collect, organize, represent, and interpret relationships in data sets that have one or more variables. They	DATA ANALYSIS AND PROBABILTY • Identify claims based on statistical data, evaluate the reasonableness of the claim, design a study to investigate the claim • Identify different methods of selecting samples, analyze strengths, analyze strengths and weaknesses	STATISTICS AND PROBABILITY • Experience in collecting, organizing, representing, analyzing, and interpreting data • Understand statistical concepts of measures of central tendency, measures of variation, and general distribution	STATISTICS AI • Experience analyzing, a • Understand tendency, m distribution • Know how

determine probabilities and use them to make predictions about events.	of each method and the possible bias in a sample • Understand the meaning of, and be able to identify or compute the minimum, the lower quartile, the median, the upper quartile, the inter-quartile range, and the maximum of a data set • Analyze, interpret, and display single- and two-variable date in appropriate bar, line and circle graphs, stem-and leaf plots and box-and whisker plots, explain which type of display are appropriate for various data sets • Represent two-variable data with a scatter plot on the coordinate plane, describe how the data points are distributed, if it appears to be linear, draw a line that appears to best fit the data, write the equation on that line • Understand and recognize equally likely events • Find the number of possible arrangements of several objects by using the Basic Counting principle	• Know how to represent data in various graphs including bar, line, circle and pictographs, line plots, stem-and-leaf plots, box plots, histograms, scatter plots • Understand probability of simple and compound events and its use in quantifying uncertainty • Provide opportunities to explore empirical probability from simulations and from data collected and analyzation of theoretical probability on the basis of a description of the underlying sample space • Use of probability trees and simulations using objects such as spinners, dice, slips of paper, etc. to solve problems	including b stem-and-le plots • Understand events and • Opportuniti simulations theoretical the underly • Use of prob such as spi problems
Standard 7: PROBLEM SOLVING Students make decisions about how to approach problems and communicate their ideas. They use strategies, skills, and concepts in finding and communicating solutions to problems. They determine when a solution is complete and reasonable and move beyond a particular problem by generalizing to other situations.	PROBLEM SOLVING • Use graphing to estimate solutions and check estimates with analytic approaches • Make precise calculations and check the validity of the results in the context of the problem • Decide whether a solution is reasonable in the context of the original situation • Note the method of finding the solution and show a conceptual understanding of the method by solving similar problems	PROBLEM SOLVING • Use instructional strategies to encourage student's development of critical thinking, problem solving, and performance skills • Understand problem solving and the reasoning process as the basis for mathematical inquiry	PROBLEM SOL • Use of instr developmen performanc • Understand as the basis

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

ALGEBRA I

	Student Standard	**Teacher Preparation Standard**
Standard 1. OPERATIONS WITH REAL NUMBERS Students simplify and compare expressions. They use rational exponents, and simplify square roots.	OPERATIONS WITH REAL NUMBERS • Simplify and compare expressions • Use rational expressions • Simplify square roots • Use dimensional analysis to organize conversions and computations	OPERATIONS WITH REAL NUMBERS • Know the number systems from whole numbers to fractions and integers, rational, irrational and real numbers • Use properties and operations to simplify expressions, including square roots and exponents • Understand the use of number theory and unit analysis
Standard 2. LINEAR EQUATIONS AND INEQUITIES Students solve linear equations and inequalities in one variable. They solve word problems that involve linear equations, inequalities, or formulas.	LINEAR EQUATIONS AND INEQUITIES • Solve linear equations and inequalities in one variable • Solve related word problems	LINEAR EQUATIONS AND INEQUITIES • Extend operations and properties to include solving linear equations and inequalities in one variable • Use mathematical language and symbolism to solve word problems related to linear equations and inequalities
Standard 3. RELATIONS AND FUNCTIONS Students sketch and interpret graphs representing given situations and understand the concept of a function and analyze the graphs/functions.	RELATIONS AND FUNCTIONS • Sketch and interpret graphs • Understand the concept of a function and analyze their graphs • Find domain and range	RELATIONS AND FUNCTIONS • Understand the concepts of relations and functions and their use in the growth of math ideas • Understand different representations of functions (tabular, graphical symbolic, verbal) • Understand the strengths and limitations of each representation • Know how to move among these representations

Standard 4. GRAPHING LINEAR EQUATIONS AND INEQUALITIES Students graph linear equations and inequalities in two variables. They write equations of lines and find and use the slope and y-intercept of lines. They use linear equations to model real data.	GRAPHING LINEAR EQUATIONS AND INEQUALITIES • Graph linear equations and inequalities in two variables • Find and use slopes and intercepts • Model situations with linear equations and use them to make predictions	GRAPHING LINEAR EQUATIONS AND INEQUALITIES • Extend operations and properties to solving and graphing linear equations and inequalities in 2 variables • Extend operations and properties to solving systems of linear equations and inequalities in 2 variables by appropriate methods • Understand strengths and limitations of each method • Understand the concepts of relations and functions and their graphs
Standard 5. PAIRS OF LINEAR EQUATIONS AND INEQUALITIES Students solve pairs of linear equations using graphs and using algebra. They solve pairs of linear inequalities using graphs. They solve word problems involving pairs of linear equations.	PAIRS OF LINEAR EQUATIONS AND INEQUALITIES • Solve systems of linear equations and inequalities in two variables by appropriate methods (graphs and algebraic) • Solve related word problems	PAIRS OF LINEAR EQUATIONS AND INEQUALITIES • Extend operations and properties to solving and graphing linear equations and inequalities in 2 variables • Extend operations and properties to solving systems of linear equations and inequalities in 2 variables by appropriate methods • Understand strengths and limitations of each method • Understand the concepts of relations and functions and their graphs
Standard 6. POLYNOMIALS Students add, subtract, multiply, and divide polynomials. They factor quadratics.	POLYNOMIALS • Add, subtract, multiply, and divide polynomials • Factor quadratics	POLYNOMIALS • Perform operations and properties on polynomials • Understand different techniques of factoring polynomials

Standard 7. ALGEBRAIC FRACTIONS Students simplify algebraic ratios and solve algebraic proportions.	ALGEBRAIC FRACTIONS • Apply properties of fractions, proportions and factoring to algebraic structures	ALGEBRAIC FRACTIONS • Simplify algebraic fractions • Solve algebraic proportions
Standard 8. QUADRATIC, CUBIC, AND RADICAL EQUATIONS Students graph and solve quadratic and radical equations. They graph cubic equations.	QUADRATIC, CUBIC, AND RADICAL EQUATIONS • Extend operations and properties for solving and graphing to higher order equations • Integrate technology with mathematics	QUADRATIC, CUBIC, AND RADICAL EQUATIONS • Graph and solve quadratic and radical functions by various methods • Graph cubic equations • Understand and describe the relationships among the solutions of an equation, the zeros of a function and the χ-intercepts of a graph, and the factors of a polynomial equation • Use graphing technology to find approximate solutions of quadratic and cubic equations
Standard 9. MATHEMATICAL REASONING AND PROBLEM SOLVING Students use a variety of strategies to solve problems.	MATHEMATICAL REASONING AND PROBLEM SOLVING • Use a variety of strategies to solve problems • Develop and evaluate mathematical arguments and proof • Decide whether the answer is reasonable in the context of real world situations	MATHEMATICAL REASING AND PROBLEM SOLVING • Understand and use a variety of instructional strategies to encourage students' development of critical thinking, problem solving and performance skills • Determine the reasonableness of results in the context of the situation

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

ALGEBRA II

	Student Standard	**Teacher Preparation Standard**
Standard 1. RELATIONS AND FUNCTIONS Students graph relations and functions and find zero. They use function notation and combine functions by composition. They interpret functions in given situations.	RELATIONS AND FUNCTIONS • Graph relations and various types of functions (polynomials, rational and algebraic), and find zeros • Use function notation and perform operations on functions, including composition • Interpret functions in given situations • Use graphing technology to further explore relations and functions	RELATIONS AND FUNCTIONS • Understand the concepts of relations and various types of and their graphs and their use in the growth of mathemati • Perform operations on functions, including composition • Integrate technology with mathematics
Standard 2. LINEAR AND ABSOLUTE VALUE EQUATIONS AND INEQUALITIES Students solve systems of linear equations and inequalities and use them to solve word problems. They model data with linear equations.	LINEAR AND ABSOLUTE VALUE EQUATIONS AND INEQUALITIES • Solve systems of linear equations and inequalities and use them to solve word problems • Model data with linear equations and use them to make predictions • Graph absolute value equations and inequalities	LINEAR AND ABSOLUTE VALUE EQUATIONS AND INEQUALITIES • Solve problems requiring the use of two or three variables • Understand the concept of absolute value equations and inequalities and their graphs • Understand representation of functions by modeling data
Standard 3. QUADRATIC EQUATIONS and FUNCTIONS Students solve quadratic equations, including the use of complex numbers. They interpret maximum and	QUADRATIC EQUATIONS AND FUNCTIONS • Solve quadratic equations, including the use of complex numbers • Solve equations that contain square roots • Solve systems of one and/or two-degree equations • Graph quadratic functions, find zeros, and interpret maximum and minimum values	QUADRATIC EQUATIONS AND FUNCTIONS • Develop mathematical language and symbolism of quadratic equations and functions • Extend system of real numbers to complex numbers • Perform operations on complex numbers, and graph complex numbers • Extend solving techniques to quadratic equations,

minimum values of quadratic functions. They solve equations that contain square roots.		radical equations, and systems of quadratic/linear equations • Extend the concept of graphing functions to finding zeros and interpreting maximum and minimum of quadratic functions
Standard 4. CONIC SECTIONS Students write equations of conic sections and draw their graphs.	CONIC SECTIONS • Write equations of conic sections • Draw graphs of conic sections	CONIC SECTIONS • Develop mathematical language and concepts of conic sections • Understand the concept of conic sections, their graphs and their use in the growth of mathematical ideas
Standard 5. POLYNOMIALS Students use binomial theorem, divide and factor polynomials, and solve polynomial equations.	POLYNOMIALS • Use binomial theorem to expand binomials • Divide and factor polynomials • Solve polynomial equations • Find polynomial equations given its solutions • Understand and describe the relationships among the solutions of an equation, the zeros of a function, the x-intercepts of a graph, and the factors of a polynomial expression • Use graphing technology to approximate solutions for polynomial equations	POLYNOMIALS • Develop mathematical language and concepts of polynomials and polynomial equations • Extend operations on polynomials to include binomial expansion • Extend solving equations by factoring to higher-order polynomials • Understand relationships between functions, equations, and graphs • Integrate technology with mathematics
Standard 6. ALGEBRAIC FRACTIONS Students use negative and fractional exponents. They simplify algebraic fractions and solve equations involving algebraic fractions. They solve problems of direct,	ALGEGRAIC FRACTIONS • Use negative and fractional exponents • Perform operations and solve equations involving algebraic functions • Solve problems of direct inverse, and joint variation	ALGEBRAIC FRACTIONS • Extend the use of number concepts, operations, and properties to negative and fractional exponents and algebraic functions • Develop mathematical language to include different types of variation • Extend solving problems to different types of variation

inverse, and joint variation. **Standard 7. LOGARITHMIC AND EXPONENTIAL FUNCTIONS** Students graph exponential functions and relate them to logarithms. They solve logarithmic and exponential equations and inequalities. They solve word problems using exponential functions. **Standard 8. SEQUENCES AND SERIES** Students define and use arithmetic and geometric sequences and series. **Standard 9. COUNTING PRINCIPLES AND PROBABILITY** Students use fundamental counting principles to compute combinations, permutations, and probabilities.	LOGARITHMIC AND EXPONENTIAL FUNCTIONS • Graph exponential functions and relate to logarithms • Solve logarithmic and exponential equations and inequalities • Solve word problems using exponential functions • Use calculators to find approximate logarithmic values SEQUENCES AND SERIES • Define and use arithmetic and geometric sequences and series COUNTING PRINCIPLES AND PROBABILITY • Use fundamental counting principles to compute combinations, permutations, and probabilities	LOGARITHMIC AND EXPONENTIAL FUNCTIONS • Develop mathematical language and symbolism of logarithmic and exponential functions • Understand the concept of exponential functions, their graphs, and their use in the growth of mathematical ideas • Extend the concept of solving equations to include logarithmic and exponential equations and inequalities • Integrate technology with mathematics SEQUENCES AND SERIES • Develop mathematical language and symbolism of sequences and series • Understand the concepts of arithmetic and geometric sequences and series their use in the growth of mathematical ideas COUNTING PRINCIPLES AND PROBABILITY • Develop mathematical language and symbolism of probability • Develop and apply the fundamental counting principle

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

GEOMETRY

	Student Standard	**Teacher Preparation Standard**
Standard 1. LINES, ANGLES, and PLANES Students find lengths and midpoints of lines. They describe and use parallel and perpendicular lines. They find slopes and equations of lines.	LINES, ANGLES, AND PLANES • Find length and midpoint of line segments • Find slopes and equations of lines • Describe and use parallel and perpendicular lines • Understand and use the special relationships between angles formed by parallel lines and transversals	LINES, ANGLES, AND PLANES • Understand how geometry is used to describe the world in which we live • Analyze two dimensional figures • Use coordinate geometry to solve real world problems
Standard 2. POLYGONS Students identify and describe polygons, and measure interior and exterior angles. They use congruence, similarity, symmetry, tessellations, and transformations. They find measures of sides, perimeters, and areas.	POLYGONS • Identify and describe polygons • Find measures of angles, sides, perimeters and areas • Use congruence, similarity, symmetry, tessellations and transformations	POLYGONS • Analyze two dimensional figures • Include the study of tessellations, symmetry and polygons • Use coordinate and transformational geometry • Develop skills to build and justify conjectures • Emphasize spatial visualizations
Standard 3. QUADRILATERIALS Students identify and describe simple quadrilaterals. They use congruence and similarity. They find measures of sides, perimeters, and areas.	QUADRILATERIALS • Identify and describe relationships among quadrilaterals • Find measures of sides, perimeters, and areas of quadrilateral • Use congruence and similarity to solve problems involving quadrilaterals	QUADRILATERIALS • Understand how geometry is used to describe the world in which we live • Use geometry to solve real world problems • Analyze two dimensional figures • Use coordinate geometry to prove properties of triangles • Solve problems and hone skills in building justifications and coherent arguments for the plausibility of conjectures • Emphasize spatial visualization

Standard 4. TRIANGLES Students identify and describe types of triangles. They identify and draw altitudes, medians, and angle bisectors. They use congruence and similarity. They find measures of sides, perimeters, and areas. They apply inequality theorems.	TRIANGLES • Identify and describe types of triangles • Identify draw and construct congruent triangles, altitudes, medians, and angle bisectors • Use congruence and similarity to solve problems involving triangles • Find measure of sides, perimeters and areas of triangles • Understand and apply inequality theorems as related to triangles • Use coordinate geometry to prove properties of triangles • Prove Pythagorean theorem and use it to solve problems	TRIANGLES • Understand how geometry is used to describe the world in which we live • Use geometry to solve real world problems • Analyze two dimensional figures • Use coordinate geometry to prove properties of triangles • Solve problems and hone skills in building justifications and coherent arguments for the plausibility of conjectures • Emphasize spatial visualization
Standard 5. RIGHT TRIANGLES Students prove the Pythagorean Theorem and use it to solve problems. They define and apply the trigonometric relations sine, cosine, and tangent.	RIGHT TRIANGLES • Define and apply trigonometric relationships of sine, cosine and tangents • Solve problems involving special right triangles • Solve word problems involving right triangles	RIGHT TRIANGLES • Investigate and solve problems using trigonometry
Standard 6. CIRCLES Students define ideas related to circles: e.g., radius, tangent. They find measures of angles, lengths, and areas. They prove theorems about circles. They find equations of circles.	CIRCLES • Define and understand relationships of ideas related to circles (radius, tangent, chord, etc.) • Perform constructions related to circles • Prove and apply theorems related to circles • Find measures of angles, lengths and areas • Find equations of circles	CIRCLES • Use coordinate geometry to write the equation of a circle • Emphasize spatial visualization

Standard 7. POLYHEDRA AND OTHER SOLIDS Students describe and make polyhedra and other solids. They describe relationships and symmetries, and use congruence and similarity. **Standard 8. MATHEMATICAL REASONING AND PROBLEM SOLVING** Students use a variety of strategies to solve problems.	POLYHEDRA AND OTHER SOLIDS • Describe and make polyhedra and geometric solids • Explore relationships between faces, edges and vertices of polyhedra • Identify properties of congruent and similar solids • Describe symmetries of geometric solids MATHEMATICAL REASONING AND PROBLEM SOLVING • Use a variety of strategies to solve problems • Develop and evaluate mathematical arguments proofs	POLYHEDRA AND OTHER SOLIDS • Understand how geometry is used to describe the world in which we live • Use geometry to solve real world problems • Analyze 3 dimensional figures • Investigate measurement, congruence, and symmetry of 3 dimensional figures including the use of physical models • Use concrete models to develop concepts and solve problems MATHEMATICAL REASONING AND PROBLEM SOLVING • Focus on intuitive, "common sense" investigations of geometric concepts so that general properties emerge and are used as the basis for conjectures and deductions • Emphasize spatial visualization • Formalize thinking and reasoning • Provide students with broad experiences in the range of applications • Students to select appropriate tools from technology, concrete materials drawings and diagrams for solving problems

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

PRE-CALCULUS

	Student Standard	**Teacher Preparation Standard**
Standard 1. RELATIONS and FUNCTIONS Students use polynomial, rational, and algebraic functions to write functions and draw graphs to solve word problems, to find composite and inverse functions, and to analyze functions and graphs. They analyze and graph circles, ellipses, parabolas, and hyperbolas.	RELATIONS AND FUNCTIONS • Use polynomial, rational, and algebraic functions to write functions and draw graphs • Find composite and inverse functions • Analyze conic sections • Use the concepts of point and line symmetry • Solve word problems using functions and equations	FUNCTIONS AND RELATIONS • Understand different representations of functions • Understand the concepts of relations and functions and their use in the growth of mathematical ideas • Understand the operations of functions
Standard 2. LOGARITHMIC AND EXPONENTIAL FUNCTIONS Students solve word problems involving logarithmic and exponential functions. They draw and analyze graphs, and find inverse functions.	LOGARITHMIC AND EXPONENTIAL FUNCTION • Solve word problems involving logarithmic & exponential functions • Graph logarithmic & exponential functions and their inverses • Find domain, range, intercepts, and asymptotes of logarithmic and exponential functions	FUNCTIONS AND USE OF VARIABLES • Experience representing and solving problems requiring the use of logarithms and exponentials • Understand the concepts of relations, functions, their graphs and their use in the growth of mathematical ideas
Standard 3. TRIGONOMETRY in TRIANGLES Students define trigonometric functions using right triangles. They solve word problems/apply the laws of sines and cosines.	TRIGONOMETRY IN TRIANGLES • Define trigonometric functions using right triangles • Solve word problems using the law of sines and cosines • Calculate the area of a triangles given two sides and the angle between them	GEOMETRY AND MEASUREMENT • Use trigonometric concepts to analyze triangular shapes • Use trigonometry to calculate the area of geometric shapes

Standard 4. TRIGONOMETRIC FUNCTIONS Students define trigonometric functions using the unit circle and use degrees and radians. They draw and analyze graphs, find inverse functions, and solve word problems.	TRIGONOMETRIC FUNCTIONS • Define trigonometric functions using the unit circle, degrees, and radians • Graphs and analyze trigonometric functions and their inverses • Solve word problems using trigonometric functions • Convert degrees to radians	FUNCTIONS AND THEIR USE • Understand the concepts of trigonometric functions their graphs, and their use in the growth of mathematical ideas • Experience in representing and solving problems requiring the use of trigonometric functions • Understand different angular measuring systems
Standard 5. TRIGONOMETRIC IDENTIES AND EQUATIONS Students prove trigonometric identities, solve trigonometric equations, and solve word problems.	TRIGONOMETRIC IDENTIES AND EQUATIONS • Prove trigonometric identities • Solve trigonometric equations	**GEOMETRY AND MEASUREMENT** • Experience solving equations using trigonometry functions as variables • Extend and use the operations and properties of algebra to prove trigonometric identities
Standard 6. POLAR COORDINATES AND COMPLEX NUMBERS Students define polar coordinates and complex numbers and understand their connection with trigonometric functions.	POLAR COORDINATES AND COMPLEX NUMBERS • Define polar coordinates using trigonometric functions • Define complex numbers using trigonometric functions • Graph relations using polar coordinates	NUMBER SYSTEMS, NUMBER THEORY, ALGEBRA AND LINEAR ALGEBRA • Study the system of complex numbers using polar representation • Study complex numbers as solutions to equations
Standard 7. SEQUENCES and SERIES Students model data with linear and non-linear functions.	SEQUENCES AND SERIES • Define and use arithmetic & geometric sequences and series • Understand the concept of limit • Use arithmetic & geometric sequence & series to	CALCULUS AND ANALYSIS • Have a firm grasp of the notion of limit • Understand development of mathematical language and symbolism • Understand the concept of sequence and series

	solve word problems	• Experience representing and solving problems requiring the use of sequence and series
Standard 8. DATA ANALYSIS Students model data with linear and non-linear functions.	DATA ANALYSIS • Model data with linear and non-linear functions	NUMBER SYSTEMS, NUMBER THEORY, ALGEBRA AND LINEAR ALGEBRA • Understand the relationships between two variables using scatter plots curves of best fit • Use technology to organize data, interpret and analyze data
Standard 9. MATHEMATICAL REASONING AND PROBLEM SOLVING Students use a variety of strategies to solve problems.	MATHEMATICAL REASONING AND PROBLEM SOLVING • Use a variety of strategies to solve problems • Develop and evaluate mathematical arguments and proofs	MATHEMATICAL REASONING AND PROBLEM SOLVIING • Understand and use a variety of instructional strategies to encourage students' development of critical thinking, problem-solving and performance skills

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

CALCULUS

	Student Standard	**Teacher Preparation Standard**
Standard 1. LIMITS ANDCONTINUITY Students understand the concept of limit, find limits of functions at points and at infinity, decide if a function is continuous, and use continuity theorems.	LIMITS AND CONTINUITY • Understand concept of limit • Find limits at a point and at infinity • Decide if a function is continuous • Use continuity theorems	CALCULOUS AND ANALYSIS • Understand the concept and role of limits • Explain the concept of a limit • Find limits by substitution, factoring, canceling and rationalization methods • Find one-sided limits, limits at infinity and special limits • Understand the Intermediate Value Theorem and the Extreme Value Theorem • Understand the communicate analytically, graphically and numerically the mathematical language • Apply technology judiciously
Standard 2. DIFFERENTIAL CALCULUS Students find derivatives of algebraic, trigonometric, logarithmic, and exponential functions. They find derivatives of sums, products, and quotients, and composite and inverse functions. They find derivatives of higher order, and use logarithmic differentiation and the Mean Value Theorem.	DIFFERENTIAL CALCULUS • Find derivatives of algebraic, trigonometric, logarithmic and exponential functions • Find derivatives of sums, products, quotients and composites and inverse functions • Find derivatives of higher order functions • Use logarithmic differentiation • Use Mean Value Theorem	CONCEPTS OF CALCULUS • Find slope at a point on a curve • Find equation of a tangent line on a curve • Find slope, equation of tangent line, extrema, point of inflection and concavity • Understand the relationship between f and whether it is increasing or decreasing and the sign of f′ • Understand the relationship between the concavity of f and the sign of f″ • Sketch and analyze f, f′, and f″ • Use implicit differentiation to find the derivative of an inverse function • Solve optimization problems • Find, understand and interpret average rate of change, instantaneous rate of change, velocity and acceleration

		• Model related rates • Understand and communicate analytically, graphically and numerically the mathematical language • Apply technology judiciously
Standard 3. APPLICATIONS OF DERIVATIVES Students find slopes and tangents, maximum and minimum points, and points of inflection. They solve optimization problems and find rates of change.	APPLICATIONS OF DERIVATIVES • Find slope, equation of tangent line, extrema, point of inflection and concavity • Solve optimization problems • Find rates of change • Understand the relationship between f and whether it is increasing or decreasing and the sign of f′ • Understand the relationship between the concavity of f and the sigh of f″	CALCULUS AND ANALYSIS • Find slope at a point on a curve • Find equation of a tangent line on a curve • Find slope, equation of tangent line, extrema, point of inflection and concavity • Understand the relationship between f and whether it is increasing or decreasing and the sign of f′ • Understand the relationship between the concavity of f and the sign of f″ • Sketch and analyze f, f′, and f″ • Use implicit differentiation to find the derivative of an inverse function • Solve optimization problems • Find, understand and interpret average rate of change, instantaneous rate of change, velocity and acceleration • Model related rates • Understand and communicate analytically, graphically and numerically the mathematical language • Apply technology judiciously
Standard 4. INTEGRAL CALCULUS Students define integrals using Riemann Sums, use the Fundamental Theorem of	INTEGRAL CALCULUS • Define integral using Riemann Sums • Understand and use fundamental Theorem of Calculus to find integrals • Understand and use basic properties of integrals	CONCEPTS OF CALCULUS • Understand and use the fundamental Theorem of calculus to evaluate define and indefinite integrals • Use basic properties of integrals • Integrate by substitution • Approximate integrals by using Riemann Sums,

Calculus to find integrals, and use basic properties of integrals. They integrate by substitution and find approximate integrals.	• Find approximate integrals	Trapezoidal Rule, and technology, of functions represented algebraically, geometrically, and numberically. • Understand that integration is used to find areas • Understand that integration is the inverse operation of differentiation • Use rectangular approximations to find approximate integral value • Use left/right/mid-points of equal subdivisions to calculate Riemann sums • Interpret the definite integral as a Riemann sum • Understand and communicate analytically, graphically and numerically the mathematical language • Apply technology judiciously.
Standard 5. APPLICATIONS of INTEGRATION Students find velocity functions and position functions from their derivatives, solve separable differential equations, and use definite integrals to find areas and volumes.	APPLICATIONS OF INTEGRATION • Find velocity functions and position functions from their derivatives • Solve separable differential equations • Use definite integrals to find areas and volumes	CALCULUS AND ANALYSIS • Find specific anti-derivatives using initial condition for acceleration, velocity, position, and motion along a line • Solve and model separable differential equations • Solve differential growth and decay problems $y' = ky$ • Use definite integrals to find areas and volumes • Find average value • Use and understand the integral as an "accumulator" • Understand and communicate the mathematical language analytically, graphically and numerically the mathematical language • Apply technology judiciously

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

PROBABILITY AND STATISTICS

	Student Standard	**Teacher Preparation Standard**
Standard 1. DESCRIPTIVE STATISTICS Students gather and display data, and use measures of central tendency and variability.	DESCRIPTIVE STATISTICS • Create, compare, and evaluate data displays using various methodologies *(histograms, scatter plots, cumulative distribution functions) • Calculate measures of central tendency *(various means, median, and mode) and measures of variations *(range, quartiles, variance, and standard deviation)	DESCRIPTIVE STATISTICS • Provide or have a variety of experiences in collecting, organizing, representing, analyzing and interpreting data • Know and understand the key statistical concepts concerning measures of central tendency and measures of variation
Standard 2. PROBABILITY Students solve problems involving the use of probability and probability distributions.	PROBABILITY • Apply the counting principle, permutations, and combinations in the context of real world situations • Develop rules for finding probabilities of combined and complementary events • Use and understand conditional probability *(ex: Bayes' Theorem) • Investigate probability distributions and be able to calculate their means and variances • Use and apply the normal distribution and the central limit theorem	PROBABILITY • Explore empirical probability from simulations and collected data • Analyze theoretical probability based on a description of an underlying sample space • Apply probability rules for simple and compound events • Use various probability rules to quantify uncertainty
Standard 3. STATISTICAL INFERENCE Students use confidence intervals and hypothesis tests, fit straight lines to data, and calculate correlation coefficients.	STATISTICAL INFERENCE • Calculate and use confidence intervals, hypothesis tests of means and differences between means • Use the principle of least squares to find curves of best fit • Calculate and interpret correlation coefficients	STATISTICAL INFERENCE • Use various techniques to examine the relationships between two variables including scatter plots and a means of approximating a line of best fit • Use discrete and continuous probability distributions to make inferences about populations • Be aware of misuses of statistics and common

		misconceptions of probability when making inferences • Use confidence intervals, hypothesis testing, correlations, and regression to make inferences
Standard 4. MATHEMATICAL REASONING AND PROBLEM SOLVING	MATHEMATICAL REASONING AND PROBLEM SOLVING • Use problem solving strategies to approach problem situations, explain reasoning, and to check reasonableness of answers • Use problem solving strategic and various techniques to investigate probability situations as applied to distributions, confidence intervals, and hypothesis tests	MATHEMATICAL REASONING AND PROBLEM SOLVING • Provide opportunities to explore the power and use of simulations as a problem solving technique for making decisions based on uncertainty • Conduct experiments involving dice, spinners, random numbers, and computer programs to generate simulated probability and statistical situations • Explore other topics to stimulate problem solving and reasoning in probability and statistics (ex. fair games, expected values, odds, elementary counting techniques, conditional probability area models to represent geometric probability)

STANDARDS ALIGNMENT OVERVIEW: ***What Indiana's students & teachers need to know and be able to do in Mathematics.***

DISCRETE MATH

	Student Standard	**Teacher Preparation Standard**
Standard 1. COUNTING TECHNIQUES Students use counting techniques.	COUNTING TECHNIQUES • Use varied representations to find outcomes. • Use the fundamental counting principle. • Use combinatorial reasoning to solve problems and find probabilities. • Use simulations to solve counting and probability problems.	COUNTING TECHNIQUES • Probability trees, elementary counting techniques, and simulations should be used to solve problems. • Should include an introduction to combinatorics. • Extensive experience using and creating simulations of probability. • The power of simulation as a problem-solving technique for making decisions under uncertainty should be a prominent experience.
Standard 2. MATRICES Students use matrices.	MATRICES • Use matrices to organize and store data. • Use matrix operations, row reduction techniques, inverse of a matrix, and Markov chains to solve problems	MATRICES • Investigations should include matrices. • Use of matrices and matrix operations to record information and to deal with solutions of systems of equations.
Standard 3. RECURSION Students use recursive techniques.	RECURSION • Use recursive thinking and finite differences to solve problems.	RECURSION • The distinction between continuous and discrete approaches in the solution of mathematical problems should also be a part of the experiences provided by these teachers and should be introduced initially at an intuitive and informed level.
Standard 4. GRAPH THEORY Students use graph theory techniques.	GRAPH THEORY • Use graphs to model a problem situation. • Use critical path analysis to solve scheduling problems. • Use graph coloring techniques, minimal spanning trees, and bin-packing techniques to solve problems.	GRAPH THEORY • Graphs and trees should be explored, along with properties of graphs and trees, matrix representations of graphs, and incidence paths in graphs.

Standard 5. SOCIAL CHOICE Students use the mathematics of social choice.	SOCIAL CHOICE • Use election theory techniques to analyze election data. • Use weighted voting techniques to decide voting power. • Use fair division to divide continuous objects and solve apportionment problems.	SOCIAL CHOICE • Should include both discrete and continuous probability distributions and should use distributions to make inferences about populations
Standard 6. LINEAR PROGRAMMING Students use linear programming techniques.	LINEAR PROGRAMMING • Use geometric techniques and the Simplex method to solve optimization problems.	LINEAR PROGRAMMING • Teachers of mathematics should understand how geometry is used to describe the world in which we live and how geometry can be used to solve real-world problems.
Standard 7. GAME THEORY Students use game theory.	GAME THEORY • Use game theory to solve strictly and non-strictly determined games	GAME THEORY • Fair games and expected value, odds should be introduced.
Standard 8. COMMUNICATION Students read text, data, tables, and graphs with comprehension and understanding. They write to explain answers, justify mathematical reasoning, and describe problem-solving strategies	COMMUNICATION • The ability to communicate about math will develop and deepen the students' understanding of mathematical concepts.	COMMUNICATION • Experience the development of mathematical language and symbolism and how these have influenced the way we communicate mathematical ideas.
Standard 9. MATHEMATICAL REASONING AND PROBLEM SOLVING Students use problem-solving skills.	MATHEMATICAL REASONING AND PROBLEM SOLVING • Use a variety of strategies to solve problems. • Develop and evaluate mathematical arguments and proofs. • Decide whether the answer is reasonable in the context of a real-world situation.	MATHEMATICAL REASONING AND PROBLEM SOLVING • Understand and use a variety of instructional strategies to encourage student development of critical thinking, problem-solving, and performance skills. • Determine the reasonableness of the results in the context of the situation.